

Remember Bug on a square track?
 Take out the worksheet & take
 2 min 37 seconds to refresh your
 memory with your group members.

* Teacher Notes *

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.



Graphing Trig Functions



Remember Bug on a
 Square Track?



In your notes, NEATLY re-draw the graph that
 represented the x-values of the bug's path.

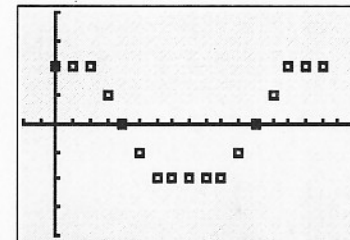
Then, NEATLY re-draw the graph that represented
 the y-values of the bug's path.

The BUGS ARE LINKS to the old assignment (bug on a square track)

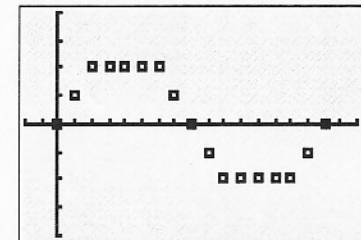
Ask students to re-draw
 both the x & y graphs

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.

Bug on a Square Track



x-values



y-values

As you look at these
 graphs, imagine how
 the bug's path on the square
 "unravels" to look like
 these graphs

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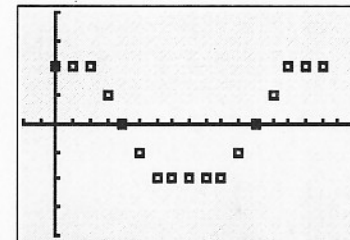
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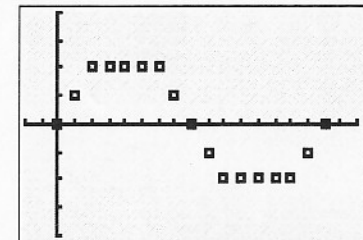
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Bug on a Square Track



x-values



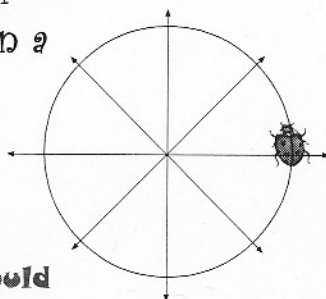
y-values

As you look at these
 graphs, imagine how
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Allow students to discuss what might change if it were a \odot .

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.

How might our two graphs change if the bug was on a CIRCLE TRACK?



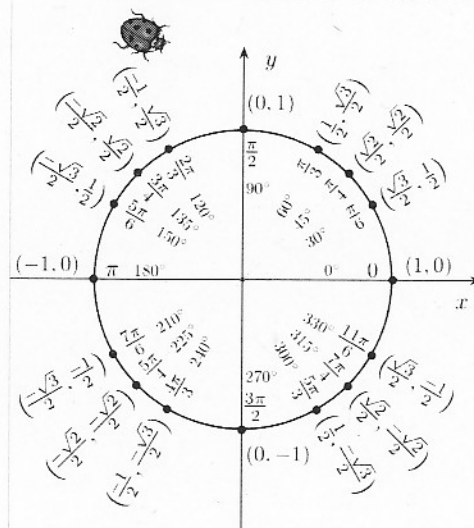
Draw a new graph that would represent the x-values.

And, another one that would represent the y-values.



If they "argue"—they will have more bug-in to see what really does happen

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.



Using what we know about a UNIT CIRCLE how might we make an accurate graph?



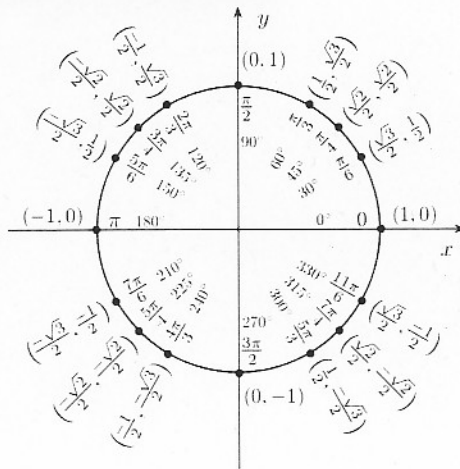
lead them to 2

the x & y coordinates of the \odot will give the position of the bug just like before

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.

Which coordinate is associated with COSINE? (x or y?)

Cosine graph

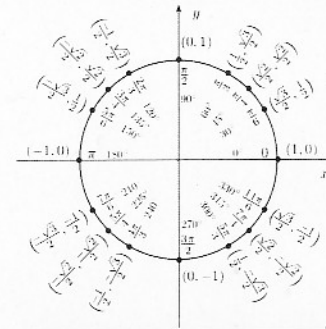


So, we will first tackle the x-coordinates (cosine)

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.

Cosine graph

Make a chart of the cosine values versus the angle measure in degrees.



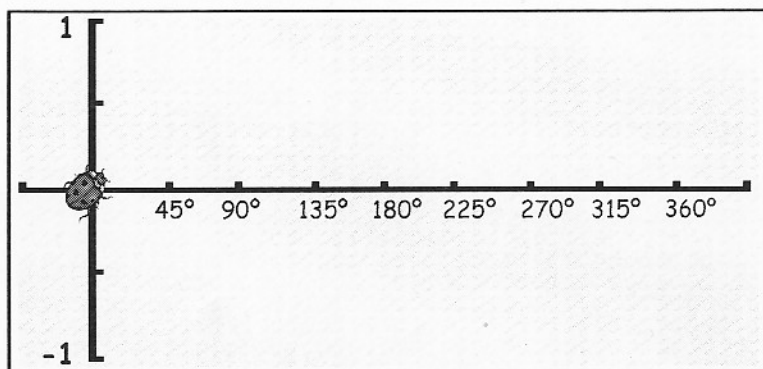
Make a chart like this one in your notes and fill it in.

Degree	Exact Cosine value	Approximate Cosine value
0	1	1
30	$\sqrt{3}/2$	0.87
45	$\sqrt{2}/2$	0.71
60		
90		
120		
135		
150		
180		
210		
225		
240		
270		
300		
315		
330		
360		


Give them time to work (can split work up!)

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.

Now, make a graph based on the degrees and the approximate values of cosine that you found. Make sure your graph goes from 0° to 360° on the x-axis and between -1 and 1 on the y-axis.

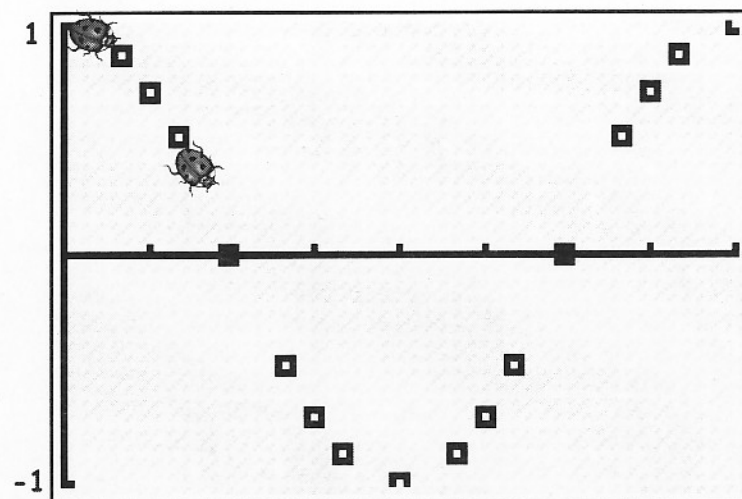


What kind of a pattern does the sine graph make?


Could you extend this graph beyond 360° ? 

This scatter-plot was made by putting the degrees in L1 & the X-coordinates in L2.
Window: $[0, 360]$ $[-1, 1]$

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.



What kind of a pattern does the sine graph make?

Could you extend this graph beyond 360° ? 

You can show students how to create a scatter plot or skip it if short on time!

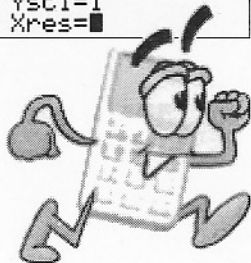
Click to reveal the graph under rectangle

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.

Consult your calculator!

WINDOW
Xmin=0
Xmax=360
Xscl=45
Ymin=-1
Ymax=1
Yscl=1
Xres=■

Plot1 Plot2 Plot3
Y1=cos(X)
Y2=■
Y3=■
Y4=■
Y5=■
Y6=■
Y7=■



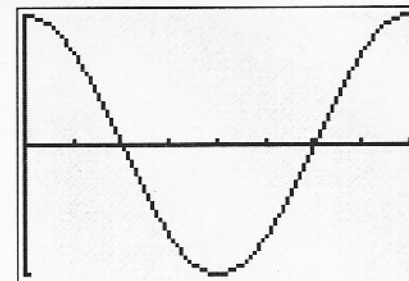
What do you see?

Use the **TRACE** key to explore the graph.

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.

Circle track vs. square track

How are they the same?
how are they different?



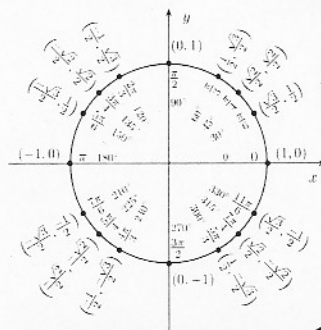
Trace allows them to compare x & y coordinates.

More rounded
but, basically the
same!

I changed it to radians to make the connection that the graphs look the same

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.

Sine graph



Make a chart like this one in your notes and fill it in.

This time, we are going to create a sine graph using RADIANS!

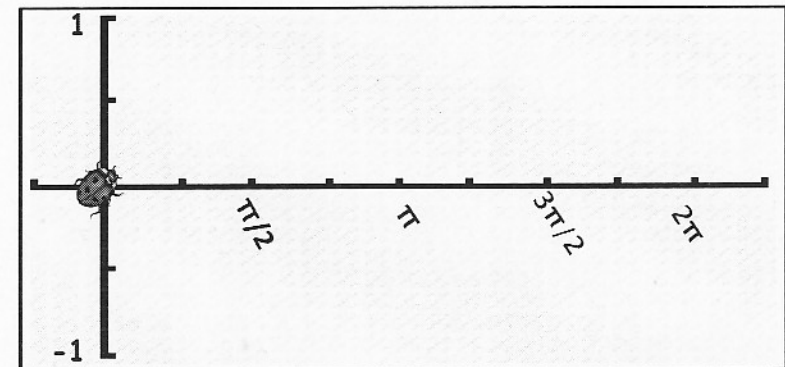
Radian	Sin(θ)
0	0
$\pi/2$	
π	
$3\pi/2$	
2π	

$$\sin(\theta) = y$$

$$2\pi = 360^\circ!$$

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.

Now, make a graph based on the RADIANS and the values of sine that you found.



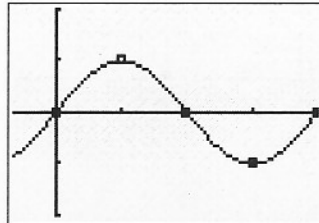
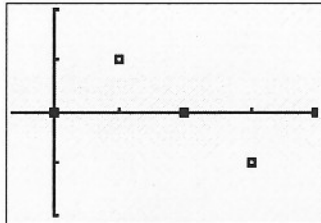
What kind of a pattern does the sine graph make?

Could you extend this graph beyond 360°?

Made with a
Scatterplot

$$y = \sin(x)$$

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.



Circle track vs. square track

**How are they the same?
how are they different?**

What kind of a pattern does the sine graph make?

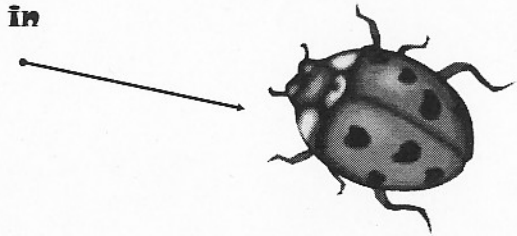
Could you extend this graph beyond 360°?



This link will take
you to an applet
that "unravels" the circle
you can hit "draw"

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.

**See my path in
real time!**



I'm a link!

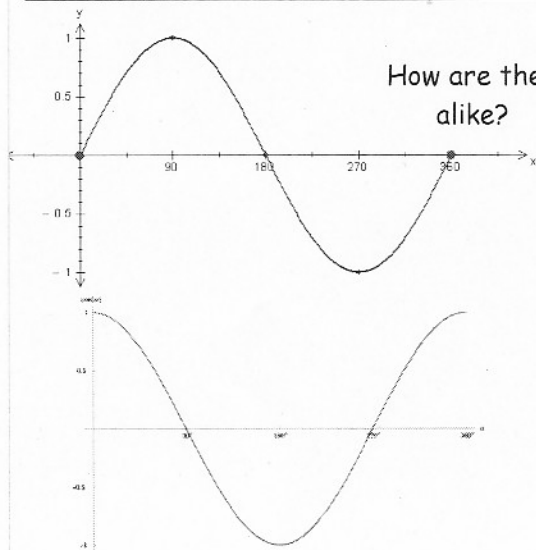
to see the circle unravel
quickly, or press the
+ button to make

it go in steps.

I would do "+" first then
"draw"

the cosine graph is transparent. After students brainstorm how they are alike/different,

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.



How are they alike?

How are they different?

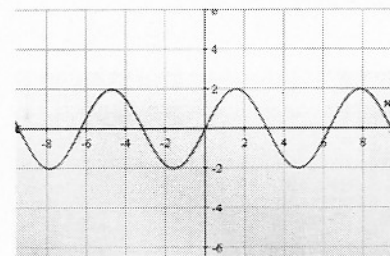


Move the cosine graph on top of the sine graph
Sine functions can be "transformed" into cosine functions & vice versa

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.

What would happen if the bug kept going and going?

Click on the graph!

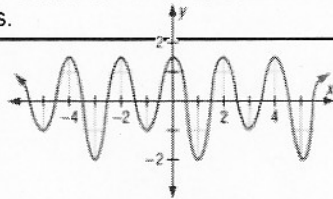


↑ **link!**

this link takes you to Edward Burger videos about periodic functions (very short!)

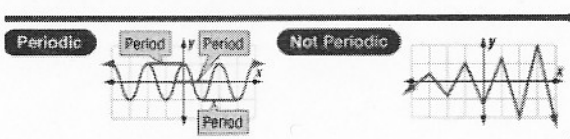
Some
periodic
examples

Learning Goal: Students will understand how to graph sine, cosine and tangent graphs.



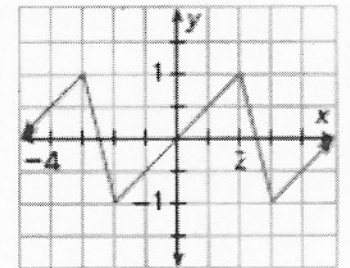
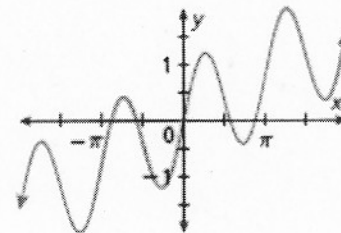
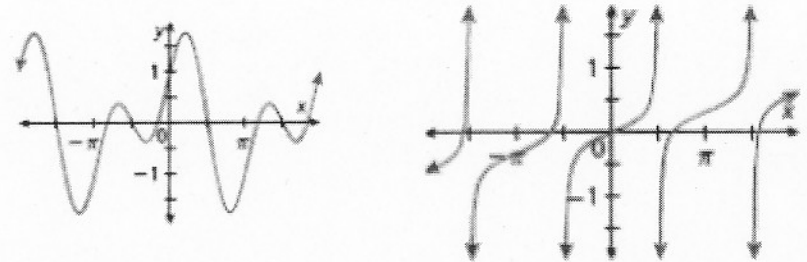
Periodic

The pattern repeats exactly,
so the function is periodic,
with period 4.



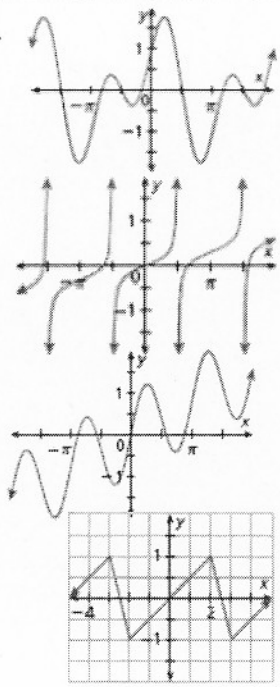
(From the
video!)

Ask students to
decide as a group
which are periodic

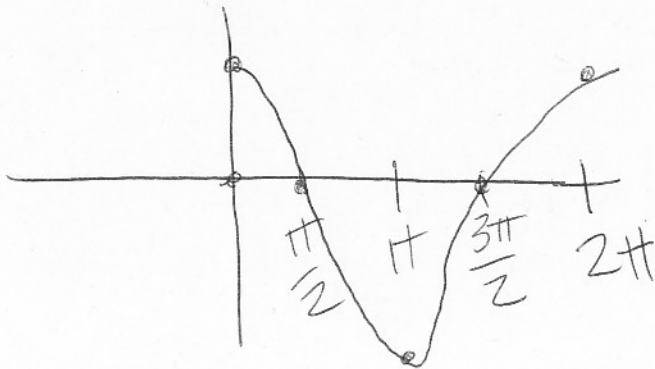


& which are not

Same graphs as
the last page.
Place into
appropriate
columns

Periodic	Not Periodic
	

Periodic	Not Periodic
	<p>Create two <u>UNIQUE</u> graphs...one that is periodic, and one that is not!</p>



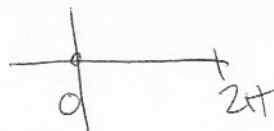
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Ticket out.... without looking!

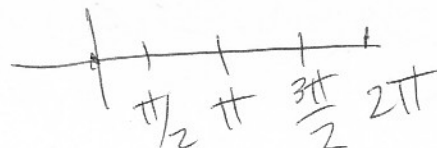
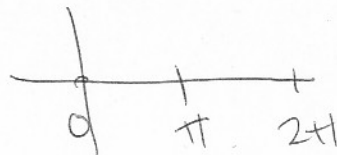
Draw one full period of a cosine graph

- in radians
- from 0 to 2π
- Include 5 major points...

Break up into
quartiles



(5 major
points



Fill in the tables for the tangent function (one in degrees and one in radians). Then make a graph for each. Describe what you notice.

degree	$\sin \theta / \cos \theta$	tangent value	Radian	$\tan(\theta)$
0	0/1	0	0	
30	$(1/2)/(\sqrt{3}/2)$.58		
45	$(\sqrt{2}/2)/(\sqrt{2}/2)$	1	$\pi/4$	
60				
90			$\pi/2$	
120				
135			$3\pi/4$	
150				
180			π	
210				
225			$5\pi/4$	
240				
270			$3\pi/2$	
300				
315			$7\pi/4$	
330				
360			2π	

Homework